PAPER BACKING AND ADHESIVE SHEET USING THE SAME

Technical Field of the Invention

The present invention relates to a paper backing, and more particularly, to a paper backing for supporting a secondary layer. Here, "secondary layer" refers to the layer to be supported on a paper backing by that paper backing, or in other words, to the layer to be additionally or incidentally formed on a paper backing. Examples include various types of layers or films such as an adhesive layer, coating layer or ink layer. The present invention also relates to the use of said paper backing, and more particularly, to an adhesive sheet that uses the paper backing of the present invention. The adhesive sheet of the present invention, particularly in the case of using it as a masking material, is able to be torn in a desired shape and perform proper masking without impairing hand-tearability. In addition, after use, it can be cleanly peeled in a single operation without being accompanied by ripping, breaking or slivering. Furthermore, "hand-tearability" refers to being able to be torn well along a desired tearing line when the paper backing is torn by hand, and accordingly, there is no occurrence of the problem of, for example, separation occurring between the upper and lower layers in a paper layer, causing only the upper layer to be torn, while the bottom layer at least partially remains.

Background

Various products have been proposed and are commercially available for use as adhesive sheet in the prior art. Similarly, various types of backings are known for use as the backing that supports the adhesive layer in these adhesive sheets. Among the numerous types of backings, in the case of adhering an adhesive sheet to an adhered object for a certain objective and then peeling off the adhesive sheet following completion of that objective, a porous backing is typically used in which beaten wood pulp and synthetic short fiber, etc. are blended followed by the uniform impregnation and fixation of a synthetic rubber such as, for example, butyl rubber. However, in this type of porous backing, if the synthetic rubber content is too low, the strength of the backing is unable to overcome adhesive strength when peeling the adhesive sheet, resulting in the problems of tearing or breaking. Conversely, if the synthetic rubber content is too high, although the

above mentioned problems are resolved as a result of improved physical strength, a new problem results in the form of lifting of the tape.

Japanese Patent No. 2589357 relates to a porous backing invented to solve the problems of porous backing for adhesive sheet of the prior art as described above. In this porous backing, the fibrous substance density differs between a first layer side and a second surface layer side, rubber and/or synthetic resin is impregnated into a porous tissue material composed of a fibrous substance in which the fibrous substance density of a first surface layer side is greater than the fibrous substance density of a second surface layer side, and that impregnated amount is greater on a first surface layer side than a second surface layer side. When this porous backing is used in an adhesive sheet, since the impregnated amount of rubber and so forth of a first surface layer side is greater than a second surface layer side, physical strength can be improved and due to the presence of a second surface layer side, rigidity is inhibited. Consequently, conformability of the adhesive sheet to an adhered object during sheet adhesion is improved, the adhesive sheet can be applied without lifting, and the adhesive sheet can be peeled off without slivering or breaking.

However, in the case of the porous backing described in Japanese Patent No. 2589357, although physical strength can be improved to prevent tearing and breaking of the sheet by increasing the impregnated amount of rubber and so forth of the first surface layer side, corresponding to the increase in strength, the disadvantage results in which the sheet cannot be torn easily by hand. In other words, this sheet has the disadvantage of having poor hand-tearability. Being able to tear adhesive tape easily by hand is an extremely important property in terms of adhesion workability, ease of handling and so forth.

Further, in the porous backing described in Japanese Patent No. 2589357, although a first surface layer side of a porous thin leaf material that composes said porous backing is formed from a fibrous substance in which the fibrous substance density is higher than a second surface layer side (namely, Kraft paper, crepe paper or Japanese paper, and preferably Japanese paper composed of a blend of beaten wood pulp and synthetic short fiber), in this type of fibrous substance, in the case of attempting to change the blending ratio of wood pulp and synthetic short fiber, several problems cannot be avoided. For

example, in the case of applying an adhesive layer to one side of a porous backing and using it as an adhesive sheet, if the blending ratio of synthetic short fiber to wood pulp in that backing is too low, the resulting backing lacks physical strength so that when the adhesive sheet is peeled off, the adhesive strength of the adhesive layer relative to the adhered object is larger than the strength of the backing itself, thereby resulting in the occurrence of tearing and breaking of the adhesive sheet, and preventing the adhesive sheet from being peeled off favorably. Conversely, if the blending ratio of synthetic short fiber is too large, although the problem of tearing and breaking in the adhesive sheet as described above is solved due to the improved tearing strength, at the same time, it becomes difficult to tear or cut the adhesive sheet by hand. Accordingly, a new problem occurs in the form of decreased "hand-tearability" as previously explained that means decreased adhesion workability.

Summary of the Invention

The present invention provides an improved backing that can be torn and cut without impairing hand-tearability when used as the backing of an adhesive sheet, and can be cleanly peeled off without being accompanied by slivering or breaking of the sheet following use of the adhesive sheet. The present invention also provides an improved adhesive sheet that can be advantageously used as a masking material in particular.

In one of its aspects, the present invention provides a paper backing for supporting a secondary layer which has a double-layer paper structure comprising a first paper layer and a second paper layer, said first paper layer and said second paper layer each being manufactured from wood pulp and short fiber, wherein the first paper layer and the second paper layer have a different blending ratio of short fibers to wood pulp.

In addition, in another of its aspects, the present invention provides an adhesive sheet comprising a paper backing and an adhesive layer provided on one of its surfaces, said paper backing having a double-layer paper structure comprising a first paper layer and a second paper layer, in which said first paper layer and said second paper layer each is manufactured from wood pulp and short fiber, wherein the first paper layer and the second paper layer have a different blending ratio of short fibers to wood pulp, and said adhesive layer being provided on the surface of said first paper layer having said blending ratio of

short fibers to wood pulp that is larger than the blending ratio of short fibers to wood pulp of said second paper layer.

In the adhesive sheet according to the present invention, said paper backing, in addition to rubber and/or synthetic resin impregnated throughout its entirety, also preferably has a top coating layer on the surface of said second paper layer located on the opposite side of said first paper layer. It is also preferable that said adhesive sheet can be used advantageously particularly as a masking material.

As described above, the paper backing according to the present invention is characterized by providing a difference in the blending ratios of short fiber in the wood pulp and short fibers, that respectively constitute the paper layers, between the first paper layer and the second paper layer. Here, the short fiber "blending ratio" refers to the blending ratio of short fiber to wood pulp contained in the pulp liquid when paper is made from wood pulp and short fiber. Paper is made from wood pulp and short fiber by a process which includes the steps of, after adding water to beaten wood pulp to form a gruel, a pulp liquid is prepared by adding short fiber after which this pulp liquid is made into paper with a paper machine. In addition, the present invention is characterized by a paper backing comprising a first paper layer and a second paper layer wherein the first paper layer has a larger fiber blending ratio than the second paper layer, which is presently a single paper layer.

Detailed Description of the Invention

The following provides an explanation of the preferred modes of carrying out the present invention.

As was previously explained, the paper backing according to the present invention is especially designed to support a secondary layer. Thus, it is characterized by having a double-layer paper structure comprising a first paper layer and a second paper layer, and said first paper layer and said second paper layer are manufactured from wood pulp and short fibers, and the first paper layer and the second paper layer have a different blending ratio of short fibers and wood pulp.

In each of the first and second paper layers, the wood pulp used as a first blending component can be wood pulp that is typically used as a papermaking raw material in the field of papermaking, and is normally beaten wood pulp.

In addition, the short fiber used as the second blending component can similarly be short fiber typically used as a papermaking raw material in the field of papermaking, and includes various types of natural or synthetic short fibers. Although not limited to those listed below, examples of suitable short fiber include synthetic short fiber such as polyvinyl alcohol fibers called under the general name "vinylon", polyamide fibers, for example, polyamide fibers commercially available from E. I. du Pont, Wilmington, Delaware, under the trade designation "Nylon", polyester, polyethylene, polypropylene, polyurethane, polyvinyl chloride, polyvinylidene chloride and polyacrylonitrile, semi-synthetic short fiber such as cellulose, regenerated short fiber such as rayon, natural short fiber such as bast, seed fiber, nerve, fruit, fur and asbestos, and inorganic short fiber such as glass and metal. Above all, when preparing the paper backing of the present invention, synthetic short fiber can be advantageously used as the second blending component. Normally, the length of this short fiber is preferably within the range of about 3 to 20 mm.

Normally, in the first and second paper layers formed from wood pulp and short fiber, respectively, the blending ratio of short fiber relative to wood pulp is preferably about 50% or less.

In addition, in the paper backing of the present invention, the respective blending ratios in these two paper layers are not identical. There is no particular limitation on the difference in blending ratios between the two. The difference may be small, for example, on the order of a few percent, or may be a larger difference of about 20 to 30%. However, since poor hand-tearability may occur if the difference in blending ratios between the two exceeds 50%, normally the difference in blending ratios is preferably less than 50%. Furthermore, if the paper backing of the present invention is to he used in the manufacture of an adhesive sheet for the purpose of masking, the tearing that occurs during separation after the resulting adhesive sheet is applied to the adhered object (also known as "slivering") may be affected by the difference in blending ratios between the first paper layer and second paper layer. For example, even if the blending ratios are increased if the blending ratios end up being inverted between the first and second layers, poor slivering

generally occurs. In the past, attempt to prevent slivering included increasing the blending ratio of the overall paper layer without distinguishing between the top and bottom surfaces.

In the present invention, the difference in blending ratios in the first and second paper layers preferably is accomplished in the preparation stage of each paper layer by changing the blending proportions of wood pulp and short fiber in recognition of the blending ratio finally desired.

When the paper backing of the present invention is used for supporting an adhesive layer in particular, namely in the case of manufacturing an adhesive sheet using the paper backing of the present invention, the first paper layer preferably has the largest blending ratio of short fiber, and an adhesive layer is provided on the surface of this first paper layer as will be explained in detail below.

Normally, the making of a double-layer combination structure by producing, in combination, first and second paper layers as described above is advantageously carried out by combining a first paper layer and second paper layer into an integrated unit to an extent that the interfaces of both cannot be recognized after separately manufacturing said first and second paper layers according to a papermaking method that uses, for example, an apparatus used in the manufacturing of cardboard, such as a multi-layer former. In addition, in the manufacturing of the paper backing of the present invention in this manner, it is preferable to adjust the basis weight (g/m^2) of the first and second paper layers so that basis weight ratio of the first layer to the second layer is 95:5 to 5:95. Paper backing in which the basis weight ratio has been adjusted in this manner is able to demonstrate improved physical strength, including tearing strength, breaking strength and interlayer strength, in the first paper layer.

The paper backing of the present invention can be advantageously used for the manufacturing of products supporting various additional layers, and can be used particularly advantageously in the manufacturing of adhesive sheet. Adhesive sheet normally has a constitution that contains the paper backing of the present invention along with an adhesive layer provided on one of its surfaces, and preferably, the adhesive layer is provided on the surface of the first paper layer which has the larger blending ratio of short fiber to wood pulp. as compared to the second paper layers. The thickness of the paper backing in said adhesive sheet, the thickness of the adhesive layer on top of it, the type of

adhesive and so forth can all be those which are typically known to one skilled in this technical field or can be chosen based on the end use of the article. In addition, the adhesive sheet of the present invention may have another layer on the same side as the adhesive layer or on the opposite side of the adhesive layer. An example of such a layer is a release layer.

The adhesive sheet of the present invention can be used particularly advantageously as a masking material in painting work and so forth. In addition, it is advantageous for that purpose that the paper backing additionally contain a water-dispersed impregnant impregnated throughout the paper backing, and preferably a water-dispersed impregnant containing for its main ingredient rubber, synthetic resin or a combination thereof, and have a top coating layer on the surface of the second paper layer located on the opposite side from the first paper layer.

Examples of rubber that can be used advantageously as water-dispersed impregnant in the manufacturing of the adhesive sheet of the present invention include natural rubber, synthetic isoprene rubber, butyl rubber, styrene butadiene rubber and acrylic rubber. In addition, examples of synthetic resin that can similarly be used advantageously include acrylic resin. The preferable impregnated amounts of these impregnants, when explained on the basis of their solid content, are normally within the range of 1 to 30 g/m^2 and preferably within the range of 5 to 20 g/m^2. If the impregnated amount of impregnant in the paper backing is less than 1 g/m^2, fiber bundling may become insufficient thereby preventing use as the backing of an adhesive sheet for masking. In addition, the paper backing may tear between the first and second paper layers and some of the layer(s) may remain behind thereby preventing the paper backing from being peeled off again. Conversely, if the impregnated amount of impregnant exceeds 30 g/m^2, since the rigidity of the backing may become excessively strong, tearing strength may decrease which may result in the loss of the effect of addition of short fiber. In other words, the backing may end up being a resin film consisting primarily of paper. Application of said impregnant to the paper backing can be performed in accordance with various techniques, preferable examples of which include coating, size pressing and immersion.

The top coating layer to be applied to the surface of the second paper layer can he formed from various top coating agents. Preferable examples of top coating agents include

polyvinylacetate emulsion and polyacrylic emulsion. various types of coating methods can be advantageously used for coating.

The manufacturing of an adhesive sheet for the purpose of masking by using a paper backing manufactured by combining a first paper layer and second paper layer and impregnating with rubber and/or synthetic resin in the manner described above can be performed in accordance with various procedures. Preferably, however, it can be performed by first applying the above-mentioned top coating agent to the surface of the second paper layer of the paper backing to form a top coating layer, and then providing a layer of a weakly adhesive material such as silicon resin or long-chain alkyl ester resin on top of that layer in the form of a back treatment agent. Next, an adhesive layer can be formed by applying a routinely used adhesive such as natural rubber or acrylic rubber as described above to the surface of the first paper layer among the surfaces of the paper backing (surface not in contact with the second paper layer).

Examples

The following provides an explanation of the present invention with reference to its examples.

Example 1

Preparation of Paper Backing:

An amount equal to 20% by weight (based on the total amount) of polyvinyl alcohol (vinylon) short fiber (length: approx. 3 to 20 mm, commercially available from Kurare, Japan) was mixed with beaten wood pulp to prepare a pulp gruel after which the pulp gruel was formed into paper having a basis weight of 20 g/m^2 with a papermaking machine to prepare a first paper layer. Moreover, a similar procedure was repeated, except that vinylon short fibers were not blended in, to obtain a second paper layer having a basis weight of 20 g/m^2. Next, the first paper layer and second paper layer were combined into a single unit to the extent that the interfaces of both paper layers could not be distinguished by a papermaking method that uses a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. An impregnant in the form of acrylic resin emulsion was impregnated throughout the resulting paper backing

under the condition that the impregnated amount of solid portion was 5 g/m^2. In order to assess the hand-tearability of the acrylic resin-impregnated paper backing obtained in this manner, tearing strength in the vertical and horizontal directions of the paper backing were measured in accordance with the procedure stipulated in Japanese Industrial Standards, JIS P8116. Measurement results were obtained as shown in Table I shown later.

Preparation of Adhesive Tape:

Acrylic adhesive for masking (product name: MT TACK5268ER, commercially available from Mitsui Chemical, Japan), an acrylic pressure-sensitive adhesive, was applied to the surface of a first paper layer of the acrylic resin-impregnated paper backing prepared in the above-mentioned step (containing vinylon short fiber) to form an adhesive layer having a film thickness of 30 μm. Moreover, Sumikaflex (registered trade name, commercially available from Sumitomo Chemical, Japan), a polyvinylacetate emulsion, was applied to the surface of the second paper layer not containing vinylon short fiber at a covering amount of 3 g/m^2 and dried. Long-chain alkyl acrylic resin (as a separation promoter) was then applied on top of the above-mentioned polyvinylacetate emulsion at a covering amount of 0.05 g/m^2 and dried. As a result, an adhesive tape was obtained having an adhesive layer on one side of the paper backing.

In order to evaluate the slivering resistance of the resulting adhesive tape, five aluminum panels (30 mm wide x 100 mm long) were prepared according to the procedure of JIS Z2307, after which pieces of adhesive tape cut into narrow strips measuring 15 mm wide were affixed to each aluminum panel. Then, a roller having a load of 2 kg was passed back and forth over the adhesive tape at the rate of 300 mm/minute. After completely adhering the adhesive tape to the aluminum panels due to the pressure applied by the roller, the aluminum panels were allowed to stand for 16 hours at room temperature. After completion of the prescribed standing time, the adhesive tape was rapidly pulled off the aluminum panels by hand using a peeling direction of 180°C. The number of pieces of adhesive tape in which slivering occurred among the five pieces of adhesive tape pressed onto the aluminum panels was visually confirmed. The results obtained relating to slivering resistance (namely, slivering of adhesive tape did not occur in any of the pieces of adhesive tape) were obtained as shown in Table 1,

Example 2

The procedure described in Example 1 was repeated except as follows. In the present example to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the first paper layer was increased from 20% by weight to 30% by weight as shown in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not be distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Example 1.

When the hand-tearalbility and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 1 were obtained.

Example 3

The procedure described in Example 1 was repeated except as follows. In the present example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, although the blending ratio of vinylon short fiber in the first paper layer was kept at 20% by weight, vinylon short fiber was blended into the second paper layer, which had previously used a vinylon short fiber blending ratio of 0% by weight, according to the procedure described in the above-mentioned Example 1 to obtain a blending ratio of 10% by weight as described in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not be distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Example 1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table I were obtained.

Example 4

The procedure described in Example I was repeated except as follows. In the present example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the first paper layer was increased from 20% by weight to 30% by weight, and vinylon short fiber was blended into the second paper layer, which had previously used a vinylon short fiber blending ratio of 0% by weight, according to the procedure described in the above-mentioned Example 1 to obtain a blending ratio of 10% by weight as described in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not be distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Example 1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 1 were obtained.

Comparative Example 1-1

The procedure described in the above-mentioned Example 1 was repeated except as follows. In the present comparative example, a paper backing consisting of a single layer was prepared instead of the paper backing having a double-layer combined structure for the sake of comparison. Namely, 20% by weight of vinylon (commercially available from Kurare) was mixed with beaten wood pulp to prepare a pulp gruel after which the pulp gruel was formed into paper having a basis weight of 20 g/m^2 with a papermaking machine. A single-layer paper backing was obtained having the appearance of Japanese paper and a basis weight of 40 g/m^2. An acrylic resin-impregnated paper backing and

adhesive tape were then prepared in the same manner as the above-mentioned Example 1 by using this paper backing.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 1 were obtained.

Comparative Example 1-2

The procedure described in the above-mentioned Comparative Example 1-1 was repeated except as follows. In the present comparative example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the paper backing was increased from 20% by weight to 30% by weight as shown in Table 1. A single-layer paper backing was obtained having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result of following treatment, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Comparative Example 1-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 1 were obtained.

Comparative Example 2-1

The procedure described in the above-mentioned Example 1 was repeated except as follows. In the present comparative example, the blending ratio of vinylon short fiber was changed so that it was greater in the second paper layer than in the first paper layer in a paper backing having a double-layer combined structure for the sake of comparison. Namely, a pulp gruel was prepared from beaten wood pulp and this pulp gruel was formed into paper having a basis weight of 20 g/m^2 with a paprmaking machine to prepare a first paper layer not containing vinylon short fiber. Moreover, an amount equal to 20% by weight (based on the total amount) of polyvinyl alcohol (vinylon) short fiber (length: approx. 3 to 20 mm, commercially available from Kurare) was mixed with beaten wood pulp to prepare a pulp gruel after which the pulp gruel was formed into paper having a basis weight of 20 g/m^2 with a papermaking machine to prepare a second paper layer.

Next, the first paper layer and second paper layer were combined into a single unit to the extent that the interfaces of both paper layers could not be distinguished by a papermaking method that uses a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2.

Next, an impregnant in the form of acrylic resin emulsion was impregnated throughout the resulting paper backing under the condition that the impregnated amount of solid portion was 5 g/m^2. When the hand-tearability of the acrylic resin-impregnated paper backing obtained in this manner was evaluated according to the procedure described in the above-mentioned Example 1, the results described in Table 1 were obtained.

An acrylic pressure-sensitive adhesive was applied to the surface of a first paper layer of the acrylic resin-impregnated paper backing prepared in the above-mentioned step not containing vinylon short fiber to form an adhesive layer having a film thickness of 30 µm. A polyvinylacetate emulsion was applied to the surface of the second paper layer of the acrylic resin-impregnated paper backing (containing vinylon short fiber) at a covering amount of 3 g/m^2 and dried. Long-chain alkyl acrylic resin was then applied on top of the above-mentioned polyvinylaylacetate emulsion at a covering amount of 0.05 g/m^2 and dried. As a result, an adhesive tape was obtained having an adhesive layer on one side of the paper backing. When the hand-tearability of the resulting adhesive tape was evaluated according to the procedure described in the above mentioned Example 1, the results described in Table I were obtained.

Comparative Example 2-2

The procedure described in the above-mentioned Comparative Example 2-1 was repeated except as follows. In the present comparative example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the second paper layer was increased from 20% by weight to 30% by weight as shown in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not be distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2 . As a

result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Comparative Example 2-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table I were obtained.

Comparative Example 2-3

The procedure described in the above-mentioned Comparative Example 2-1 was repeated except as follows. In the present comparative example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, although the blending ratio of vinylon short fiber in the second paper layer was kept at 20% by weight, vinylon short fiber was blended into the first paper layer, which had previously used a vinylon short fiber blending ratio of 0% by weight, according to the procedure described in the above-mentioned Comparative Example 2-1 to obtain a blending ratio of 10% by weight as described in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not be distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Comparative Example 2-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table I were obtained.

Comparative Example 2-4

The procedure described in the above-mentioned Comparative Example 2-1 was repeated except as follows. In the present comparative example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the second paper layer was increased from 20% by weight to 30% by weight, and vinylon short fiber was blended into the first paper layer, which had previously used a vinylon short fiber blending ratio of 0% by weight, according to the

procedure described in the above-mentioned Comparative Example 2-1 to obtain a blending ratio of 10% by weight as described in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not he distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Comparative Example 2-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 1 were obtained.

Comparative Example 2-5

The procedure described in the above-mentioned Comparative Example 2-1 was repeated except as follows. In the present comparative example, to evaluate the effects of changes in the blending ratio on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the second paper layer was increased from 20% by weight to 30% by weight, and vinylon short fiber was blended into the first paper layer, which had previously used a vinylon short fiber blending ratio of 0% by weight, according to the procedure described in the above-mentioned Comparative Example 2-1 to obtain a blending ratio of 20% by weight as described in Table 1. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not be distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Comparative Example 2-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 1 were obtained.

Table 1

		Examples				Comp. Ex. 1		Comp. Ex. 2				
		1	2	3	4	1	2	1	2	3	4	5
Vinylon blending - ratio of paper baking	First paper layer	20	30	20	30	20	30	0	0	10	10	20
	Second paper layer	0	0	10	10	--	--	20	30	20	30	30
Interlayer strength (gf/15 mm)		200	200	200	210	220	235	200	200	200	210	230
Vertical tearing strength (g)		25.6	32	30	48	42	48	25.6	32	30	48	45
Lateral tearing strength (g)		63	65	65.7	68	76	96	63	65	65.7	68	80
Slivering resistance		0/5	0/5	0/5	0/5	0/5	0/5	4/5	3/5	4/5	3/5	0/5

As can be understood from the results described in Table I above, although acrylic resin-impregnated paper backing and adhesive tape having good slivering resistance and good horizontal tearing strength used to evaluated hand-tearability are obtained in the examples, if the paper backing is of a single-layer structure as in Comparative Example 1, although slivering resistance is good, horizontal tearing strength is excessively high resulting in poor hand-tearability. In addition, in the case the first paper layer and second paper layer are inverted as in Comparative Example 2, although hand-tearability is good, slivering resistance is poor. Furthermore, in the case of Comparative Example 2-5, slivering resistance is good, but horizontal tearing strength is excessively high resulting in poor handtearability.

Example 5

In the present example, the degree to which the impregnated amount of water-dispersed impregnant affects the strength and so forth of the resulting tape was evaluated in the manufacturing of adhesive tape. Furthermore, for the sake of convenience in conducting evaluation testing in the present example, a single-layer paper backing was used instead of a paper backing having a double-layer combined structure. Namely, 10% by weight of vinylon (commercially available from Kurare) was mixed with 'beaten wood pulp to prepare a pulp gruel after which the pulp gruel was formed into paper having a

basis weight of 30 g/m^2 with a paper-making machine. A single-layer paper backing was obtained having the appearance of Japanese paper and a basis weight of 40 g/m^2.

Continuing, an impregnant in the form of styrene butadiene rubber was impregnated throughout the resulting paper backing under the condition that the impregnated amount of solid portion was 0.5, 1, 5, 15, 30 and 45 g/m^2 as described in Table 2 below using the immersion method. The tensile strength in the vertical direction, elongation and the tearing strength in the horizontal and vertical directions of the rubber-impregnated paper backing obtained in this manner were measured according to the procedures described in the above-mentioned Example 1. The measurement results described in Table 2 below were obtained, moreover, a slivering test was performed according to the evaluation of slivering resistance described in the above-mentioned Example 1. The presence or absence of tape slivering when the adhesive tape was peeled from an aluminum panel were evaluated by ranking as either "good" or "defective." The evaluation results described in Table 2 below were obtained.

Table 2

Amt. of rubber impregnated (g/m^2)	Vertical tensile strength (kg/15 mm)	Elongation (%)	Horizontal tearing strength (g)	Vertical tearing strength (g)	Slivering test
0.5	4.1	6	58	33	Defective (interlayer separation)
1	4.2	6	56	33	Good
5	4.5	7	53	30	Good
15	5.2	7	50	28	Good
30	7.1	4	30	24	Good
45	8	3	24	20	Defective (slivering)

As can be understood from the results described in Table 2 above, since the binding of fibers was insufficient when the impregnated amount was 0.5 g/m^2, the adhesive tape ended up breaking down between the layers of the backing which prevented it from being peeled off cleanly.

In addition, when the impregnated amount was 45 g/m^2 tearing strength decreases markedly resulting in slivering of the adhesive tape that prevents it from being peeled off cleanly. When the impregnated amount is within the range of 1 to 30 g/m^2, fiber binding is adequate and there is no marked decrease in tearing strength, thereby allowing the adhesive tape to be peeled off cleanly without the occurrence of slivering.

Example 6

The procedure described in the above-mentioned Example I was repeated except as follows. In the present example, to evaluate the effects of mean blending ratio (mean of the blending ratio of the first paper layer and the blending ratio of the second paper layer) on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the first paper layer was decreased from 20% by weight to 10% by weight to make the mean blending ratio 5% by weight as shown in Table 3. The first paper layer and second paper layer were combined into a single unit to an extent to which the interfaces of the two layers could not he distinguished by a papermaking method using a multi-layer former to prepare a paper backing having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Example 1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 3 were obtained. Furthermore, the results of the above-mentioned Example 1 are also shown in Table 3 for reference purposes.

Comparative Example 1-3

The procedure described in the above-mentioned Comparative Example 1-1 was repeated except as follows. In the present comparative example, to evaluate the effects of mean blending ratio (mean of the blending ratio of the first paper layer and the blending ratio of the second paper layer) on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the first paper layer was decreased from 20% by weight to 5% by weight as shown in Table 3. A single-layer paper backing was obtained having the

appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above-mentioned Comparative Example 1-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 3 were obtained.

Comparative Example 1-4

The procedure described in the above-mentioned Comparative Example 1-1 was repeated except as follows. In the present comparative example, to evaluate the effects of mean blending ratio (mean of the blending ratio of the first paper layer and the blending ratio of the second paper layer) on hand-tearability and slivering resistance, the blending ratio of vinylon short fiber in the first paper layer was decreased from 20% by weight to 10% by weight as shown in Table 3. A single-layer paper backing was obtained having the appearance of Japanese paper and a basis weight of 40 g/m^2. As a result, an acrylic resin-impregnated paper backing and adhesive tape were obtained that were similar to those obtained in the above mentioned Comparative Example 1-1.

When the hand-tearability and slivering resistance of the resulting acrylic resin-impregnated paper backing were respectively evaluated according to the procedures described in the above-mentioned Example 1, the results shown in Table 3 were obtained.

Table 3

		Example 6	Example 1	Comp. Ex. 1-3	Comp. Ex. 1-4
Vinylon blending ratio of paper backing (%)	First paper layer	10	20	5	10
	Second paper layer	5	10	--	--
Mean blending ratio (%)		5	10	5	10
Interlayer strength (gf/15 mm)		290	200	205	200
Vertical tearing strength (g)		25	25.6	28	29
Horizontal tearing strength (g)		66	63	58	61
Slivering resistance		0/5	0/5	3/5	0/5

As can be understood from the results described in Table 3, although impregnated paper backing and adhesive tape having good slivering resistance and good horizontal tearing strength used to evaluated hand-tearability are obtained in the example, if the paper backing is of a single-layer structure as in the comparative examples, slivering resistance is poor even though the vinylon blending ratio throughout the paper is equal to that of the embodiments.

As has been explained above, according to the present invention, when used as the backing of an adhesive sheet in particular, the adhesive sheet can be adhered to the covered object without being accompanied by lifting, and the adhesive sheet can be torn and cut without impairment of hand-tearability when tearing along a masking region, thereby allowing the achieving of good line following effects and masking effects. In addition, after the adhesive sheet has been used, the adhesive sheet can be cleanly and easily peeled without being accompanied by slivering or breaking of the sheet, thereby providing a good paper backing. In addition, according to the present invention, a paper backing and adhesive sheet are therefore provided that can be advantageously used in the manufacturing of adhesive tape used for the purpose of masking.